PATENT SPECIFICATION

1,025,308

DRAWINGS ATTACHED

1,025,308

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Complete Specification Published: April 6, 1966.

Index at acceptance:—B8 A(3D, 3E)
Int. Cl.:—B 65 g

COMPLETE SPECIFICATION

Static Distributor for Pulverulent Material

We, INSTITUT DE RECHERCHES DE LA SIDERURGIE FRANCAISE, a professional organization governed by French laws, of 185 rue President Roosevelt, Saint Germain-en-Laye (Seine-et-Oise), France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a static distributor for pulverulent material especially but not exclusively for pulverulent lime and as an improvement in or modification of the apparatus described and claimed in our British Patent No. 876,758 (hereinafter referred to as the "Parent Patent.")

The specification of the Parent Patent describes a static distributor or dispenser for powder comprising a removable fluidizing base in the form of a cone and consisting of two, parallel walls enclosing a spreading and distributing gas descending to the lower end of the container and equipped with nozzles distributed over the whole inner surface of the base, which is combined with a pneumatic jack fitted inside the container and arranged to actuate a needle valve closing the discharge orifice for the powder.

The present invention relates to improvements made in the above device and more particularly to the closing or sealing means actuated by the pneumatic jack, the improvements having the purpose of improving and aiding the tightness of the closure and reducing the influence of wear or abrasion thereon.

The present invention is an improvement in or modification of the static distributor as claimed in any one of the claims of our British Patent No. 876,758, the improvement or modification comprising the substitution of a ball valve for the needle valve.

Preferably, the ball valve is connected to a jack by a rod which incorporates a hinge joint; for example, a universal joint or ball-and-socket joint.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which;

Fig 1 is an axial sectional view of a static distributor according to the invention described in our aforementioned Parent Patent.

Fig 2 is an axial section of a modification thereof and

Fig 3 is a part sectional elevation of a static distributor according to the present invention.

In the Parent Patent specification, a static distributor is described as follows:

The static distributor illustrated in Fig. 1 includes chiefly a container extending downwardly, so as to form a frusto-conical section 1, the apical angle of which is equal to 60°, said section being illustrated alone without any further part of the container.

Said frusto-conical section 1, is mounted above a disconnectable fluidizing bottom 2 secured to the frusto-conical section 1, through the intermediary flanges 3 and 4 holding between them an intermediate flange 5 carrying the closing needle valve 6 and its pneumatic control jack 7.

Starting from this structure, it is possible to insert a series of identical fluidizing bottoms over containers of widely different sizes. Similarly, the dismantling of the system is a very easy matter and the replacement of the bottom can be executed speedily. Each bottom 2 is constituted by two coaxial frusto-cones having an apical angle equal to 60°, to wit: an inner cone 8 and an outer cone 9, so as to form between said cones a pressure-distributing chamber 10. The inner cone 8 is secured to a flange 5a which is sandwiched between the flanges 4 and 5.

The inner or fluidizing cone carries a large number of nozzles, said number of nozzles being generally larger than 100, which nozzles are illustrated diagrammatically at 11 and are distributed throughout the surface of the cone down to proximity with the lower end of the

latter, which lower end is formed by a seat 12 fitted inside a cover 13 at the lower end of the fluidizing cone; above the seat is formed a series of vents 14 directed so as to provide for a permanent sweeping of the exhaust port formed in the seat.

The above-mentioned valve of plastic material 6 cooperates with the seat 12 and is controlled by the pneumatic jack 7, so as to control the flow of pulverulent material. Between the needle valve and the rod 15 of the jack is inserted a damping spring 16 adapted to absorb the shocks and to protect the needle valve.

Said needle valve and jack arrangement is positioned and held axially of the apparatus, through the agency of three arms 17 rigid with the flange 5 held fast, as mentioned hereinabove, between the flanges 3 and 4.

The body of the jack 7, the three arms 17 and the flange 5 form a unitary cast member which make its mounting an easy matter. The jack is fed with compressed air, through the agency of two pipes bored in the arms 17 and in the flange 5.

The fluidizing gas is admitted at 19 into the distributing chamber 10 for the feeding of the nozzles. A further admission of conveying gases is provided at the upper end of the container above the pulverulent mass, at a point which is not illustrated.

The operation of the apparatus is as follows:

The pulverulent lime or the like powder to be injected is fed into the container and it is then fluidized through the introduction at 19 of a compressed gas such as oxygen. Said gas flowing out of the chamber 10 through the nozzles 11 produces a sufficient aeration of the pulverulent material, which reduces its apparent specific weight and fluidizes it to an extent such that it may flow out of the bottom of the apparatus through the output port of the latter, as allowed by the angle of 60° formed by the adjacent walls.

Furthermore, the introduction of the same gas above the pulverulent mass, which raises the pressure inside the container above the pressure inside the output pipe conveying the material out of the apparatus and which is not illustrated, furthers the flow of the mixture of fluid and pulverulent material into said output pipe and thereby cuts out the risk of an irregular pulsatory output flow.

Since an intimate mixture is obtained between the pulverulent material and the gas conveying it, it will be assumed that said mixture behaves in the manner of a heavy compressible fluid raised to the pressure prevailing in the upper section of the apparatus. Consequently, the opening, controlled by the needle valve operated by the jack, of the lower port connecting two volumes containing compressible fluids under different pressures allows an emptying of the static distributor into the output pipe, and through put of pulverulent material increasing and decreasing with the increase and decrease of the diameter of said port and of the difference in pressure between the inside of the apparatus and the output pipe.

In the modification illustrated in Fig. 2, the apparatus is generally similar to that which has just been described and it is secured in the same manner to the lower frusto-conical section of the container 1. The same reference numbers are applied as in the case of Fig. 1 to the parts common to these apparatus. In the case illustrated in Fig. 2, the fluidizing conical bottom 20 is made of stamped porous and sintered bronze. A limited number of nozzles is thus replaced by a very large number of small pores. The apical angle of said cone is equal to 150°. The porosity of the fluidizing cone is such that the input of compressed gas at the upper end of the container may be cut out, the conveying gases being the same as the fluidizing gases.

As in the preceding example illustrated in Fig. 1, the throughput may be cut off through a needle valve 6, of plastic material engaging its seat 12 and controlled, as precedingly, by a pneumatic jack 7, while suitably directed vents 14 distributed round the seat provide for a permanent sweeping of the output port at 12.

Obviously, it is possible, without unduly widening the scope of the invention as defined in the accompanying claims, to imagine various detail modifications and also to substitute equivalent means for those disclosed and, generally speaking many other embodiments may be provided for the invention thus defined.

Referring now to the present invention, Fig. 3 of the drawing shows the lower part of a container for distributing powders comprising a conical fluidizing base illustrated alone without any further part of the container exactly similar to that represented in the Parent Patent, and a closing device in accordance with the present invention, this device being actuated by a pneumatic jack 22 fitted inside the container on a support 23.

The shape of the discharge orifice for the powdered materials is similar to that of the orifice already described in the embodiments according to the Parent Patent, the only difference being that the valve seat 24 is convexly curved on its bearing surface.

The movable closure element is according to the present invention, constituted by a sphere or ball 25 of steel which is screwed on the end of a rod 26 connected through a ball-and-socket joint with the piston rod of the jack 22.

This joint is, in the present embodiment, formed by a ball 27 screwed on the top end of the rod 26 and fitting into a spherical socket attached to the piston rod and consisting of a spherical pocket 28 and a spherical

zone 29, held together by a tapped external ring 30. The inside diameter of the socket 28—29 is slightly greater than the diameter of the ball 27, in such manner as to provide a sufficient clearance to ensure free mobility of the assembly 25—26—27; for clarification, this clearance has been intentionally exaggerated in the drawing.

It will be evident that with such an arrangement the tight sealing of the closure can always be assured, even if the axis of the jack fails to coincide with the axis of the valve seat 24 which might happen, for instance, by the action of mechanical stresses in the assembly.

In addition, by virtue of the clearance given the ball in the assembly, the vertical displacements of the jack rod will inevitably be accompanied, during the opening and closing operations, by slight angular displacements of the rod 26 about its longitudinal axis in such manner that points on the ball 25 will not always occupy exactly the same angular positions with reference to the valve seat 24; which can but favour an even distribution of the wear by abrasion, and prolong the useful life of the arrangement.

It is considered that if the closure by means of a rigid needle with a pointed or conical valve head, is replaced by an element with a self-centring, spherical valve head, the problem of centring no longer arises, the bearing of the valve on its seat remains perfect, even if, by reason of faulty assembly or mechanical stressing during operation, the axes of the jack and the valve seat, are no longer coincident.

Moreover, the wear of the valve seats is considerably reduced, which can be explained in the following fashion: In the case of a conical valve head, a small leak causes localized wear which must increase since the phenomenon, once initiated, cannot be arrested (the needle is rigid and the head consequently always occupies the same position or attitude). In the case of a spherical valve head, on the contrary, fitted on a rod in such fashion as to be self-centring, the valve seating is not necessarily always the same. If wear takes place on one side, the equilibrium position of the sphere becomes displaced always from that side, thus tending to equalize the wear over the whole circumference.

The present invention however is in no way restricted to this particular form of embodiment and it would for instance be possible to replace the ball-and-socket joint by a universal joint in conjunction with a rotating joint, or to replace the ball 25 by a valve head in which the surface of contact is reduced to a spherical zone, without thereby transgressing the scope of the invention.

WHAT WE CLAIM IS:—

1. The improvement in or modification of the static distributor claimed in any one of the claims of our British Patent No. 876,758, the improvement or modification comprising the subtstitution of a ball valve for the needle valve.

2. A static distributor as claimed in claim 1, in which the ball valve is connected to a jack by a rod which incorporates a hinge joint.

3. A static distributor as claimed in claim 1 or 2, in which the hinge joint is a ball-and-socket joint.

4. A static distributor as claimed in claim 1 or 2, in which the hinge joint is a universal joint.

5. A static distributor as claimed in claim 4, in which the universal joint incorporates a rotatable joint which enables the rod to rotate freely about its longitudinal axis.

6. A static distributor for pulverulent material substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.

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Fig. 2

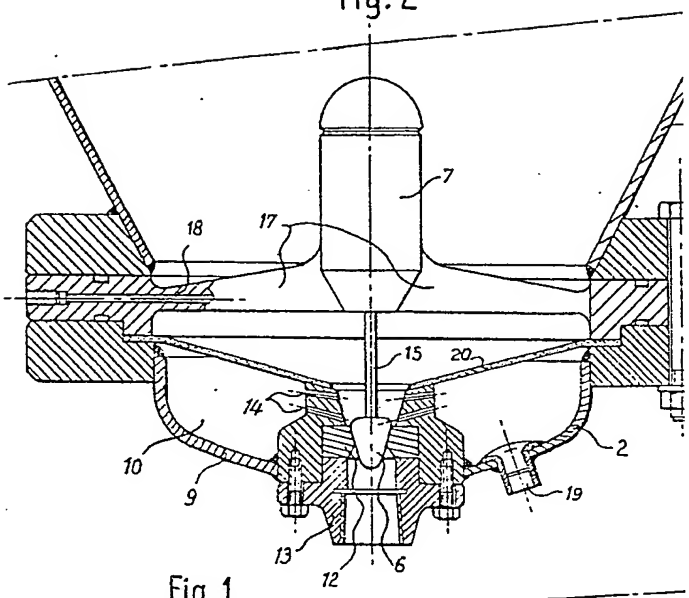
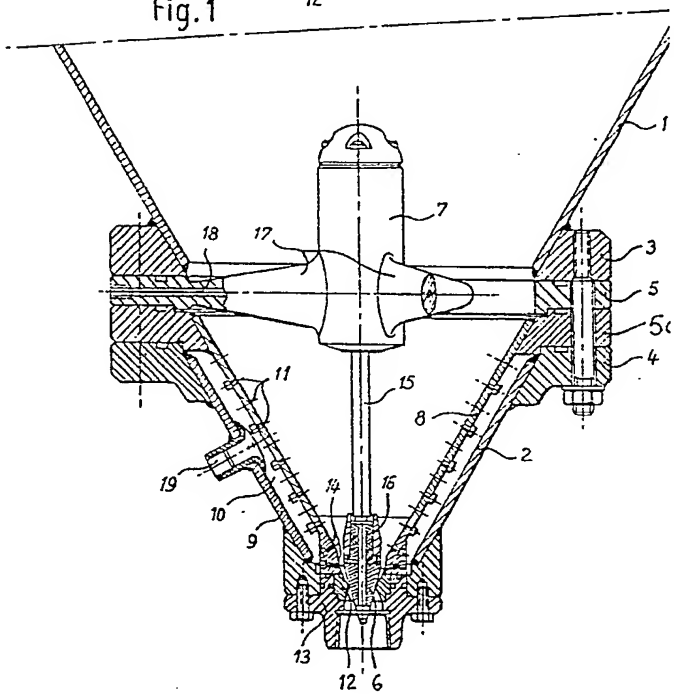
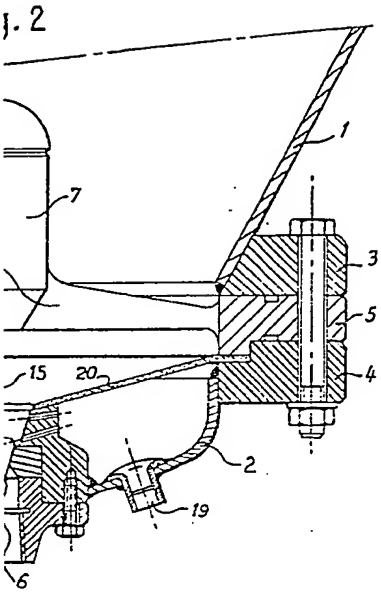
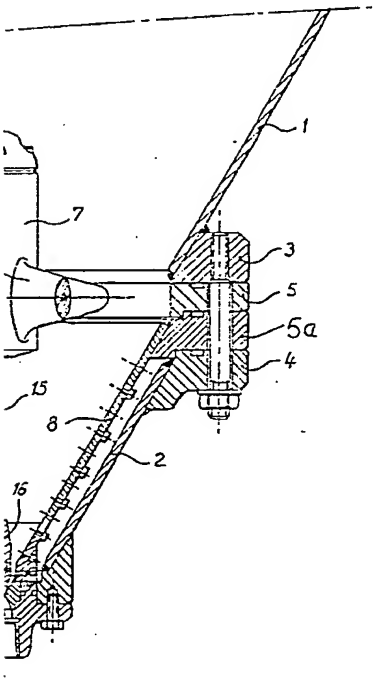


Fig. 1



1025308 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2





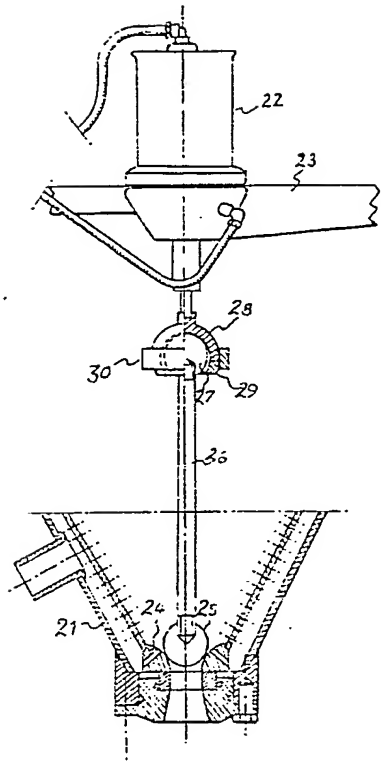


FIG. 3

1025308 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

Fig. 2

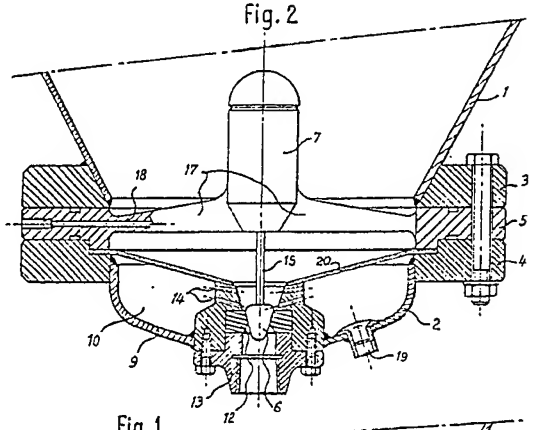
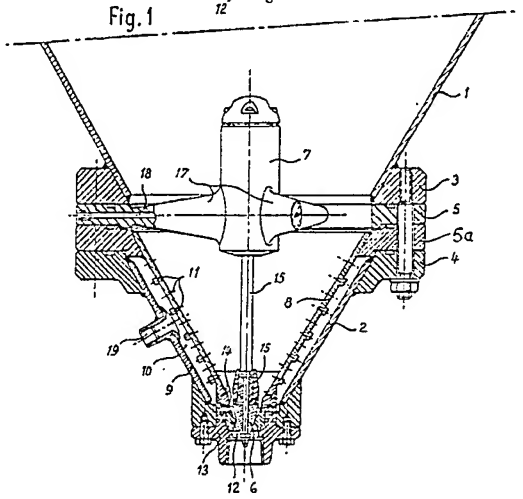


Fig. 1



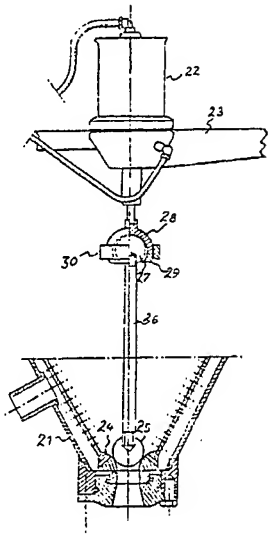


FIG. 3